Phase 2 Environmental Site Assessment, Parcel 18

Prepared for:
Hydro Aluminium Kurri Kurri Pty Ltd

Prepared by:
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Specific assumptions and limitations identified by ENVIRON as being relevant are set out in the report. The methodology adopted and sources of information used by ENVIRON are outlined in our scope of work. ENVIRON has made no independent verification of this information beyond the agreed scope of works.

This report should be read in full.

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Acronyms and Abbreviations

ACM	Asbestos Containing Materials
AHD	Australian Height Datum
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
BGL	Below Ground Level
CT	Certificate of Title
DEC	NSW Department of Environment and Conservation, now EPA
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	NSW Environment Protection Authority
ESA	Environmental Site Assessment
F	Fluoride
GMU	Groundwater Management Unit
GPS	Global Positioning System
Ha	Hectare
HIL	Health Investigation Level
HSL	Health Screening Level
HRA	Health Risk Assessment
km	Kilometres
LOR	Limit of Reporting
m	Metres
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
m AHD	Metres relative to the Australian Height Datum
m BGL	Metres below ground level
mg/L	Micrograms per Litre
NATA	National Association of Testing Authorities
ND	Not Detected
NEHF	National Environmental Health Forum
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NSW	New South Wales
n	Number of Samples
OH&S	Occupational Health & Safety
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
UCL	Upper Confidence Limit
µg/L	Micrograms per Litre
VENM	virgin excavated natural material
-	On tables is "not calculated", "no criteria" or "not applicable"

Executive Summary

This report presents the findings of a Phase 2 Environmental Site Assessment undertaken on part of the Hydro Aluminium Kurri Kurri (Hydro) owned land known as Parcel 18. Parcel 18 is a rural property comprising approximately 613 ha and is accessed from James Lane off Old Maitland Road, Sawyers Gully and located within the buffer zone and to the north of the Hydro Aluminium Kurri Kurri smelter.

Parcel 18 comprises mainly undisturbed dense bushland. An area of grassed land with limited tree cover and a tributary of the low-lying wetland known as Wentworth Swamp are located on the eastern boundary. There were no structures evident on Parcel 18 during the site walkover.

The objectives of this Phase 2 ESA assessment were to assess the potential for contamination at Parcel 18 based on historical and current land use and to assess the suitability of the site for the proposed environmental conservation (E2) use.

A Phase 1 ESA has previously been completed for the Hydro owned lands including Parcel 18 (ENVIRON (2013b) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter). The Phase 1 identified that contamination of Parcel 18 may have occurred from dust deposition due to the proximity of the Hydro smelter, and the potential for illegally dumped materials due to its remote location.

To assess for potential contaminants of concern on Parcel 18, a site walkover was completed and surface soil samples were collected from across the parcel. Sampling of surface waters was not performed for Parcel 18 as there were no sources of contamination from Parcel 18 to the surface water system identified during the assessment. There were no infilled areas, waste stockpiles, dumped waste, buried waste or asbestos containing material identified on the soil surface for Parcel 18.

Surface soil samples from across Parcel 18 were analysed for soluble fluoride. No soil contamination issues were identified at Parcel 18.

Parcel 18 is suitable for the current use and the proposed environmental conservation (E2) land use.

Hydro has separately engaged a NSW EPA-accredited Site Auditor to issue a Site Audit Statement certifying that the site is suitable for the proposed use.

1 Introduction

1.1 Background

This report presents the findings of a Phase 2 Environmental Site Assessment undertaken on part of the Hydro Aluminium Kurri Kurri Pty Limited (Hydro) owned land known as Parcel 18. Parcel 18 is located off James Lane which is accessed from the Old Maitland Road, Sawyers Gully, New South Wales (2321). The location of Parcel 18 is shown in **Figure 1**.

The work has been performed at the request of Hydro Aluminium Kurri Kurri Pty Limited (the "Client").

Hydro is currently evaluating options for the divestment of land parcels for a range of future land uses following the closure of the smelter in May 2014. A Rezoning Masterplan has been developed that identifies Parcel 18 to comprise land suitable for environmental conservation (E2) landuse.

A Phase 1 Environmental Site Assessment has previously been prepared for all Hydro owned lands and evaluated the potential for contamination (ENVIRON 2013b). The Phase 1 identified that contamination of Parcel 18 may have occurred from dust deposition due to the proximity of the Hydro smelter and from illegal dumping due to the remoteness of the area.

It is noted that at the time of the fieldwork, this land parcel was named Ecological Parcel 2 and as such the soil samples reference this name. The parcel was renamed Parcel 18 during the rezoning process.

The location of Parcel 18 in the context of the Rezoning Masterplan is shown in Figure 2.

1.2 Objectives and Scope of Work

The objectives of the assessment were to assess the potential for contamination at Parcel 18 based on historical and current land use and to assess the suitability of Parcel 18 for the purposes of environmental conservation (E2) land use.

The scope of work performed to meet the objectives comprised:

- A review of available information relating to land use to assess the potential for soil, groundwater or surface water contamination arising from historic and current activities;
- A review of published geological, hydrogeological and hydrological data to establish the environmental setting and sensitivity;
- Field work comprising:
  - Collection of surface soil samples to provide a coarse grid assessment to assess the potential for dust deposition from the smelter operations;
  - A site walkover to evaluate other potential locations of buried waste or illegal dumping.
- Data interpretation including comparison against relevant guidelines and a discussion of the findings in terms of human health and environmental risk under the current and future land use scenarios.
- If required, review of options available for remediation or management to render Parcel 18 suitable for the proposed land use.

2 Site Description

2.1 Site Location

Parcel 18 is owned by Hydro Aluminium Kurri Kurri Pty Limited and is located approximately 35km north west of the city of Newcastle and 150km north of Sydney, in New South Wales, Australia. Parcel 18 is accessed from James Lane off Old Maitland Road, Sawyers Gully, New South Wales, Australia. The location of Parcel 18 is shown in **Figure 1**.

Parcel 18 is located within the Buffer Zone of the Hydro Aluminium Kurri Kurri Smelter, to the north west of the smelter. The Buffer Zone is an area of land surrounding the smelter that provides a buffer between the smelter and surrounding communities. Parcel 18 generally comprises bushland, with an area of rural land and limited tree cover on the eastern boundary. The rural land is cleared with ground coverage of grass, a scattering of medium to large trees and is used for cattle grazing. Black Waterholes Creek flows into Wentworth Swamp in the southern portion of Parcel 18.

Parcel 18 is located within the Cessnock Local Government Area and is zoned RU2 – Rural Landscape. A small portion of Wentworth Swamp is zoned E2 – Environmental Conservation under the Cessnock Local Environment Plan 2011.

Parcel 18 is approximately 613 hectares (ha) and comprises the lot numbers and development plans listed in **Table 1**:

Table 1: Lot and Development Plans for Parcel 18.

Subarea	Lot/ DP	Area (ha)	Total Area (ha)
Parcel 18	Lot 1 DP73597 Pt 1 Lot 10 DP1082775 Pt1 Lot 11 DP1082775 Pt1 Lot 316 DP755231 Lot 317 DP755231 Lot 351 DP755231 Lot 352 DP755231 Lot 353 DP755231 Lot 356 DP755231	362.1 9.8 30.7 59.3 53.3 21.4 26.8 23.7 26.6	613.7

Land uses surrounding Parcel 18 are as follows:

- North: farmland;
- South: the Smelter site;
- East: farmland;
- West: farmland and bushland.

Parcel 18 is located approximately 230m to the north of the smelter site boundary.

2.2 Site Setting

2.2.1 Topography

Parcel 18 is located in an area of the Buffer Zone that is of higher elevation at approximately 40 m AHD The topography of Parcel 18 is elevated on the western boundary of the parcel at 50m AHD, sloping to the south east where a tributary of Black Waterholes Creek enters the parcel. A small section of Wentworth Swamp is at the eastern boundary of the parcel and is the lowest point (6m AHD) on Parcel 18.

2.2.2 Regional Geology

According to the review of the regional geology described on the Hunter Coal Field Geological Sheet, Parcel 18 is underlain by the Branxton Formation comprising conglomerate, sandstone and siltstone.

Undifferentiated Quaternary alluvium occurs over the surface of low lying areas of Parcel 18 associated with surface water bodies. Quaternary sediments which are associated with Wentworth Swamp and the Hunter River consist of gravel, sand, silt and clay.

2.2.3 Site Hydrology

Surface water from Parcel 18 discharges via infiltration and overland flow to Wentworth Swamp and associated surface water bodies.

The Wentworth Swamp system is within the Fishery Creek Catchment, where declining stream water quality and a reduction in diversity of native plants and animals has occurred due to population growth and development pressures in the last ten years (Hunter-Central Rivers Catchment Management Authority).

2.2.4 Regional Hydrogeology

Regional groundwater is expected to follow topography and flow northeast towards the surface water bodies that discharge to the Hunter River. Locally, groundwater beneath Parcel 18 is expected to flow towards Wentworth Swamp located to the east of the site.

According to the NSW Office of Environment and Heritage (Natural Resource Atlas), there are 31 licensed groundwater abstractions (bores) located approximately 7.5km north east of Parcel 18 at Maitland and South Maitland. Information for eleven bores located in a 5km radius from Parcel 18 has been included in **Appendix A**. The bores are used for monitoring purposes. No further information, such as depth to water or logging information was provided.

The Hunter River Alluvium Groundwater Management Unit (GMU) is an important groundwater resource to the region. Groundwater extraction for irrigation, urban supply, drought supply, stock, domestic and commercial/ industrial use occurs, with volumes in excess of 10,000ML per annum extracted from the Hunter River Alluvium GMU. Aquifer storage and recovery is also an important use of this GMU. It is noted that the Hunter River GMU is not the primary drinking water supply in the region, although the protection of drinking water is a water quality objective for the Hunter River (NSW Water Quality and River Flow Objectives). (www.environment.nsw.gov.au/ieo/Hunter/index.htm).

2.3 Site Sensitivity

The sensitivity of Parcel 18 with respect to surface water and groundwater is considered to be high based on the following:

- Surface water and groundwater discharge into Wentworth Swamp, located within the site, which discharges to the Hunter River within the Fishery Creek Catchment, approximately 5km northeast of Parcel 18 near Maitland.
- Declining stream water quality and a reduction in diversity of native plants and animals has occurred within the Fishery Creek Catchment and water quality down gradient of Parcel 18 has been impacted by historical coal mining;
- The Hunter River GMU is used for irrigation, urban supply, drought supply, stock, domestic and commercial/ industrial use but it is not the main drinking water supply in the region.

3 Site History

Site history investigations included in the Phase 1 ESA (ENVIRON 2013b) for the Hydro Aluminium Kurri Kurri Smelter provided the following historical information about Parcel 18:

- Earliest records (aerial photograph in 1951) showed Parcel 18 comprised bushland with less tree cover around Wentworth Swamp in the east. A track extended from Bishops Bridge Road east towards the south western end of Wentworth Swamp.

- The aerial photographs indicate that there has been little change to the bushland over the central and western portions of Parcel 18. The bushland around Wentworth Swamp in the eastern portion of Parcel 18 has been cleared for agricultural landuse.

- A car body is reportedly buried on Lot 1 DP166625. This information was provided in an interview with Mr Kerry McNaughton, Environmental Manager, Hydro Aluminium Kurri Kurri Smelter.

- Parcel 18 is located approximately 1 km from the smelter boundary and may be impacted from smelter dust deposition.

- The remoteness of Parcel 18 and surrounding bushland may also give rise to illegal dumping though it is noted that the buffer zone area is fenced and regularly monitored by Hydro personnel.

The approximate location of the buried car body is included in **Figure 3**.

4 Previous Investigations

4.1 Soil

Soil sampling undertaken in Parcel 18 as part of the Phase 2 ESA (ENVIRON (November 2012) Phase 2 Environmental Site Assessment, Kurri Kurri Aluminium Smelter) involved the collection of two surface soil samples to assess the potential impact of smelter dust deposition and irrigation of process water in this area. The soil samples (SB30 and SB31) were analysed for a combination of heavy metals, total fluoride and aluminium. The results were below the selected criteria.

Surface soil sampling locations and results are included in **Appendix B**. These results will be discussed further in Section 8.1.

4.2 Surface Water

4.2.1 ENVIRON Previous Investigations

Surface water sampling was undertaken in Parcel 18 as part of additional investigations completed at an area of the smelter known as the capped waste stockpile (ENVIRON (December 2012) Environmental Site Assessment, Alcan Mound, Kurri Kurri Aluminium Smelter). Surface water samples were collected from one location (SW7) at Wentworth Swamp within Parcel 18 and analysed for pH, electrical conductivity, fluoride, free cyanide and aluminium, which are contaminants of concern associated with the capped waste stockpile.

Results for pH and electrical conductivity were consistent with a fresh water stream. Aluminium concentrations exceeded the guideline for the protection of 95% of aquatic ecosystems at the sampling location. Free cyanide concentrations did not exceed the guidelines. Fluoride concentrations exceeded the guidelines for irrigation, stock watering and recreational use of the water.

The concentration of aluminium detected on 9th August 2012 was considered to be anomalous when compared to the sample on 28th September 2012. Additionally, samples collected for analysis of aluminium in Wentworth Swamp in August 2013 and September 2013 found concentrations to be 1.5mg/L and <0.001mg/L (ENVIRON 2013e).

Surface water sampling locations and results tables are included in **Appendix B**. These results are discussed further in **Section 8.1**.

4.2.2 Hydro Routine Monitoring

Routine surface water monitoring is undertaken in Parcel 18 by Hydro on a monthly basis and for the Annual Environmental Management Review (AEMR). Surface water samples are collected from four locations (2, 3, 9 and 44) on Wentworth Swamp and Black Waterholes Creek in Parcel 18. Surface water samples are routinely analysed for pH, electrical conductivity and fluoride. Biannually the samples are also analysed for free cyanide.

Results from routine monitoring between July 2013 and December 2013 were evaluated for this report. Results for pH and electrical conductivity were consistent with a fresh water stream. Fluoride concentrations generally exceeded the criteria for irrigation and stock watering. It is noted that three of the locations were dry in August, September, November and December 2013.

Surface water sampling locations and results tables are included in **Appendix B**. These results are discussed further in **Section 8.1**.

5 Sampling and Analytical Quality Plan

5.1 Potential Areas and Contaminants of Concern

Based on Parcel 18 historical information as discussed in **Section 3**, the following areas of concern were identified:

- Smelter dust deposition.
- Illegal dumping.

Potential contaminants of concern associated with the range of previous site activities are:

- Asbestos;
- Fluoride; and
- Aesthetic impacts.

Impacts to surface water and groundwater could occur from soluble contaminants where these are present above background concentrations. Historical site information does not suggest that impacts to surface water and groundwater have occurred. Evaluation of surface water through review of the existing routine monitoring conducted by Hydro has been included and is presented in **Section 4**. Further evaluation of groundwater and surface water is not considered to be warranted at this time and can be undertaken where contaminants in soil are present at levels that are likely to result in impacts to surface water or groundwater.

5.2 Data Quality Objectives and Data Quality Indicators

Data quality objectives (DQOs) and Data Quality Indicators (DQIs) were developed by ENVIRON using the US EPA seven-step DQO process. Completing the seven-step process helps to define the purpose of the assessment and the type, quality and quantity of data needed to inform decisions relating to the assessment of site contamination.

The seven-step DQO process and DQIs are included in **Appendix G**.

5.3 Sampling Design

The sampling design was optimised following the development of DQOs and DQIs. The sampling design is outlined below. ENVIRON notes that the historical site activities indicate potential contamination to surface soils only. No potential contamination sources to subsurface soils, surface water or groundwater have been identified.

5.3.1 Fluoride

To assess the potential for fluoride in soil from dust deposition from the Hydro Aluminium Kurri Kurri Smelter, surface soil samples were collected at a rate of one sample per 22ha.

The sample density is lower than that suggested in Table A of NSW EPA (1995) Contaminated Sites: Sampling Design Guidelines. The density is considered adequate for the purposes of this investigation for the following reasons:

- aerial dust deposition is likely to be relatively consistent over the surface of the parcel and therefore sampling on a low density will allow for identification of whether or not dust deposition is an issue; and

- in the event that elevated or variable fluoride concentrations are identified, additional sampling will be completed.

Samples were collected by trowel from surface soils on an approximate grid across Parcel 18. Sample locations were logged by GPS.

Soil samples were placed into laboratory-supplied paper bags and stored in an ice-filled cooler for transportation to the laboratory. Soil samples were transported to the laboratory under chain of custody conditions. Intra-laboratory duplicate soil samples were collected at a rate of 10%.

Soil samples were analysed for soluble fluoride, as this is the portion of total fluoride that is available for uptake in receptors including biota, flora, fauna and humans. The laboratory was NATA accredited for the analysis.

5.3.2 Asbestos

To assess the potential for asbestos and other illegally dumped wastes to be present at Parcel 18, a site walkover of accessible areas was completed. ENVIRON consider that dense bushland that is not readily accessible by foot is unlikely to have been accessed for waste dumping.

The location and type of dumped wastes were detailed on Field Information Sheets and logged by GPS. Where asbestos was confidently identified by the field personnel, no sampling was completed. If not, a sample of potential asbestos containing material (ACM) was collected for laboratory analysis. ACM fragments were collected into a zip-lock bag using dedicated disposable gloves.

If required, ACM fragments were analysed for asbestos identification by a laboratory NATA accredited for the analysis.

6 Basis for Assessment Criteria

6.1 Soil

The criteria proposed for the assessment of soil contamination were sourced from the following references:

- NEPC (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

The objective of the Phase 2 ESA is to assess soil and surface water contamination at Parcel 18 in relation to risks posed to human health and the environment under the proposed future land use of environmental conservation. As the contaminants of concern are fluoride and asbestos, guidelines for these contaminants under an environmental conservation land use scenario are provided below.

The Health Screening Levels (HSLs) for asbestos are applicable for assessing human health risk via the exposure pathway of inhalation of airborne asbestos and are presented in **Table 2.** The HSLs are generic to all soil types. As there is no HSL for rural or environmental conservation landuse, the HSL for Residential A will be used and is considered conservative.

Table 2: Health screening levels for asbestos contamination in soil (w/w)				
Form of asbestos	**Residential A[1]**	**Residential B[2]**	**Recreational C[3]**	**Commercial/ Industrial D[4]**
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF[1] (friable asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

1. The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres.

NEPM (2013) do not provide criteria for fluoride in soils in Australia. ENVIRON (2013a) conducted a preliminary level Human Health Risk Assessment (HRA) specific to fluoride in order to derive a specific preliminary screening level for fluoride for the Hydro Aluminium Kurri Kurri Smelter . The screening levels are protective of the range of human receptors are provided in **Table 3**.

Table 3: Site Specific Soil Assessment Criteria (mg/kg) for Fluoride	
Preliminary screening levels	
Land Use	**Preliminary screening level**
Residential landuse	F 440mg/kg
Recreational landuse	F 1,200mg/kg
Commercial/ Industrial landuse	F 17,000mg/kg

Soil investigation results for the samples taken from a grid formation across Parcel 18 have been compared against the residential land use screening level. The fluoride 'residential land use' screening level is considered to be suitably protective of both 'residential' and 'rural' land use because the exposure pathways (including vegetable ingestion) and behavioural

assumptions (e.g. soil ingestion rate) for the child are considered to be identical under residential and rural land use scenarios.

There is a possibility that the rural plots may contain a low density of domestic livestock such as poultry and goats, however there is limited evidence of fluoride accumulation in milk and edible tissues of animals fed high levels of fluorides (ATSDR, 2003; NAS, 1971). Rather, fluoride accumulates primarily (up to approximately 99%) in the skeletal tissues of terrestrial animals that consume fluoride-containing foliage (WHO, 1997; ATSDR, 2003). This assumption is supported by site-specific data collected during the 29th annual cattle survey conducted in March 2012 on cattle located within the site's buffer zone, and surrounding areas (AECOM, 2013). The results of this survey concluded that cattle has had little or no exposure to excess environmental fluoride; skeletal fluoride levels decreased compared to 2011 levels, with all fluoride measurements below the toxic threshold; and all cattle examined were in good health and body condition. Consequently, the residential screening level is considered to be suitably protective of rural land use that may contain a low density of domestic livestock.

Consistent with the guidance provided in the NEPM, the data was assessed against the above adopted site guidelines by:

- Comparing individual concentrations against the relevant guidelines and if discrete samples are in excess of the relevant guideline then;
- Comparing the 95% upper confidence limit (UCL) of mean against the relevant guideline also ensuring that:
    - the standard deviation of the results is less than 50% of the relevant investigation or screening level, and
    - no single value exceed 250% of the relevant investigation or screening level.

7 Results

7.1 Site Walkover

A site walkover was completed to assist with planning the field investigations and assess Parcel 18 for additional areas of imported fill or illegally dumped wastes. Parcel 18 entrance is via the northern smelter boundary or via a locked gate on Bishops Bridge Road. The site is fully fenced.

The majority of Parcel 18 comprises dense bushland with several main access tracks and a number of smaller tracks mainly through the southern portion of the site. One main access track is Bishops Bridge Road, which extends north to south through the site. The two other main access tracks extend east to west in the southern portion of the site, with one track on the southern boundary. The track on the southern boundary follows the transmission power lines alignment. Low areas of these main access tracks have been compacted with bake furnace refractory bricks to permit access in times of high rainfall.

A small portion of Parcel 18 comprises the western extent of Wentworth Swamp surrounded by cleared farmland. This portion is fenced from the remainder of the site and is used for cattle grazing. At the time of the site walkover, a significant portion of the Wentworth Swamp was dry and was accessible by foot.

There was no evidence of waste smelter material or dumped municipal waste on Parcel 18. During the site walkover, Mr Kerry McNaughton from Hydro indicated a car had been buried in the north western corner of the site. The car body was not sighted during the walkover however the approximate location has been included on **Figure 3**.

Photographs are included in **Appendix C**. Field Information Sheets are included in **Appendix D.**

7.2 Soil Investigations

Seven surface soil samples were collected from across Parcel 18 as per the sampling design to assess the potential for fluoride in soil from dust deposition from the Hydro Aluminium Kurri Kurri Smelter as shown in **Figure 3**.

A generalised lithology of the surface soils encountered at Parcel 18 is as follows:

- Topsoil: Sandy silt, orange/ brown with some cobbles, dry.

7.3 Soil Results

Soil analytical results are presented in Tables A and B in **Appendix E** and laboratory reports are included in **Appendix F**. A summary of the soil results is presented in **Table 4**.

Table 4: Summary of Soil Results

Analyte	No. of Samples	Maximum Concentration (mg/kg)	No. exceeding Site Criteria	Criteria Exceeded (mg/kg)
Fluoride	27	26	0	-

The results of surface soil sampling for fluoride demonstrate that surface soils at Parcel 18 have not been impacted by stack particulate fallout from the Hydro Aluminium Smelter.

7.4 Quality Assurance/ Quality Control

A quality assurance assessment for this report is presented in **Appendix G**. An assessment was made of data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations, as outlined in NSW DEC (2006) and NSW EPA (2007) guidelines. Overall it is considered that the completed investigation works and the data are of suitable quality to meet the project objectives.

7.5 Bake Furnace Refractory Brick

As described in Section 7.1, bake furnace refractory bricks have been used within Parcel 18 to form roadways through low lying areas that are subject to flooding. Bake furnace refractory bricks are used as an insulating material to line the bake furnace for baking of anodes and are a by-product of aluminium smelting. A chemical assessment of the bricks was undertaken in ENVIRON (2012) Application for Exemption – Refractory Brick. The chemical characterisation was undertaken on twenty composite samples and included analysis for metals, non-metallic inorganics and polycyclic aromatic hydrocarbons. The average chemical concentrations have been compared against NEPM (2013) criteria in **Table 5**. None of the average concentrations exceed the NEPM (2013) criteria for residential landuse and bake furnace refractory brick is not considered to be of environmental concern.

Table 5: Refractory Brick Chemical Characterisation				
Analyte	**PQL**	**Average**	**HIL A - NEPM (2013) Criteria**	**Average > NEPM (2013)**
Metals				
Arsenic	4	-	100	No
Beryllium	1	-	60	No
Boron	3	26	4500	No
Cadmium	0.5	0.5	20	No
Chromium	1	12	100	No
Lead	1	5	300	No
Molybdenum	1	1	-	No
Nickel	1	5	400	No
Selenium	2	-	200	No
Tin	1	1	-	No
Mercury	0.1	-	40	No
Silver	1	-	-	No
Copper	1	12	6000	No
Zinc	1	7	7400	No
Vanadium	0.5	20	-	No
Non Metallic Inorganics				
Total Fluoride	50	191	440*	No
Total Cyanide	0.5	-	-	No
Sulphur	1	1871	-	No
Total Organic Carbon	1	1910	-	No
Chloride	1	-	-	No
Electrical Conductivity	1	902	-	No
pH	1	9	-	No
Polycyclic Aromatic Hydrocarbons				
Sum of reported PAH	0.1	-	300	No

All units are mg/kg on a dry weight basis.
*Preliminary Screening Level for residential landuse from ENVIRON (2013a)

8 Site Characterisation

8.1 Conceptual Site Model

Parcel 18 predominantly consists of dense bushland, with a small portion of cleared farmland around Wentworth Swamp in the eastern portion of the site. Parcel 18 is bound by Bishops Bridge Road, and bushland on the western boundary, farmland on the northern and eastern boundaries and the smelter on the southern boundary.

Historical information indicates that the bushland and portion of Wentworth Swamp on Parcel 18 has not been developed and no evidence of development was identified during the site walkover.

One car body is understood to have been buried in the north western corner of the site. No other dumped wastes were observed during the site walkover. The location of the car body is not accurately known, and there was no surface evidence. As the area is proposed to be used for conservation purpose, and the car body does not represent an environmental or aesthetic impact, no recommendations for removal are considered to be required.

Bake furnace refractory bricks sourced from the smelter have been used to compact low areas of the main access tracks through Parcel 18. Chemical analysis of bake furnace refractory bricks has found all concentrations to be below the relevant site guidelines.

Parcel 18 has not been affected by dust deposition of fluoride from the Hydro Aluminium Kurri Kurri Smelter, with fluoride concentrations in surface soils collected during this investigation and during previous investigations below the preliminary screening level for residential land use. In addition, there is currently no source of aerial fluoride emissions as the smelter is in a care and maintenance mode.

Results of routine surface water sampling conducted by Hydro indicated that Parcel 18 has marginally elevated concentrations of fluoride in the northern portion of Wentworth Swamp. ENVIRON completed an ecological risk assessment (ENVIRON (2013d) Tier 2 Ecological Risk Assessment, Kurri Kurri Smelter), which involved an assessment of surface water quality upstream of Parcel 18 in relation to fluoride. The fluoride concentrations measured in surface water at Parcel 18 are broadly similar to fluoride concentrations used during the ecological risk assessment and as such are not expected to pose an unacceptable risk to aquatic species.

Parcel 18 is considered suitable for the current use and the proposed environmental conservation (E2) landuse.

9 Conclusions and Recommendations

This report presents the findings of a Phase 2 Environmental Site Assessment undertaken on part of the Hydro Aluminium Kurri Kurri (Hydro) owned land known as Parcel 18. Parcel 18 is a rural property comprising approximately 613 ha and is accessed from James Lane off Old Maitland Road, Sawyers Gully and located within the buffer zone and to the north of the Hydro Aluminium Kurri Kurri smelter.

Parcel 18 comprises mainly undisturbed dense bushland. An area of grassed land with limited tree cover and a tributary of the low-lying wetland known as Wentworth Swamp are located on the eastern boundary. There were no structures evident on Parcel 18 during the site walkover.

The objectives of this Phase 2 ESA assessment were to assess the potential for contamination at Parcel 18 based on historical and current land use and to assess the suitability of the site for the proposed environmental conservation (E2) use.

A Phase 1 ESA has previously been completed for the Hydro owned lands including Parcel 18 (ENVIRON (2013b) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter). The Phase 1 identified that contamination of Parcel 18 may have occurred from dust deposition due to the proximity of the Hydro smelter, and the potential for illegally dumped materials due to its remote location.

To assess for potential contaminants of concern on Parcel 18, a site walkover was completed and surface soil samples were collected from across the parcel. Sampling of surface waters was not performed for Parcel 18 as there were no sources of contamination from Parcel 18 to the surface water system identified during the assessment. There were no infilled areas, waste stockpiles, dumped waste, buried waste or asbestos containing material identified on the soil surface for Parcel 18.

Surface soil samples from across Parcel 18 were analysed for soluble fluoride. No soil contamination issues were identified at Parcel 18.

Parcel 18 is suitable for the current use and the proposed environmental conservation (E2) land use.

Hydro has separately engaged a NSW EPA-accredited Site Auditor to issue a Site Audit Statement certifying that the site is suitable for the proposed use.

10 References

ANZECC & NHMRC (1992) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites.

ENVIRON (2012) Environmental Site Assessment, Alcan Mound, Kurri Kurri Aluminium Smelter).

ENVIRON (2013a) Preliminary Screening Level, Health Risk Assessment for Fluoride and Aluminium, Part of the Kurri Kurri Aluminium Smelter, Hart Road, Loxford.

ENVIRON (2013b) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter.

ENVIRON (2013d) Tier 2 Ecological Risk Assessment, Kurri Kurri Smelter.

ENVIRON (2013e) Phase 2 Environmental Site Assessment, Parcel 17.

Hunter Catchment Management Trust (2000) Wallis and Fishery Creeks Total Catchment Management Strategy.

NEPC (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure (NEPM).

NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme (Second Edition).

NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination.

11 Limitations

ENVIRON Australia prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Kurri Kurri Pty Ltd dated 18 September 2013 and in accordance with our understanding and interpretation of current regulatory standards.

A representative program of sampling and laboratory analyses was undertaken as part of this investigation, based on past and present known uses of Parcel 18. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous.

Site conditions may change over time. This report is based on conditions encountered at Parcel 18 at the time of the report and ENVIRON disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent ENVIRON's professional judgment based on information made available during the course of this assignment and are true and correct to the best of ENVIRON's knowledge as at the date of the assessment.

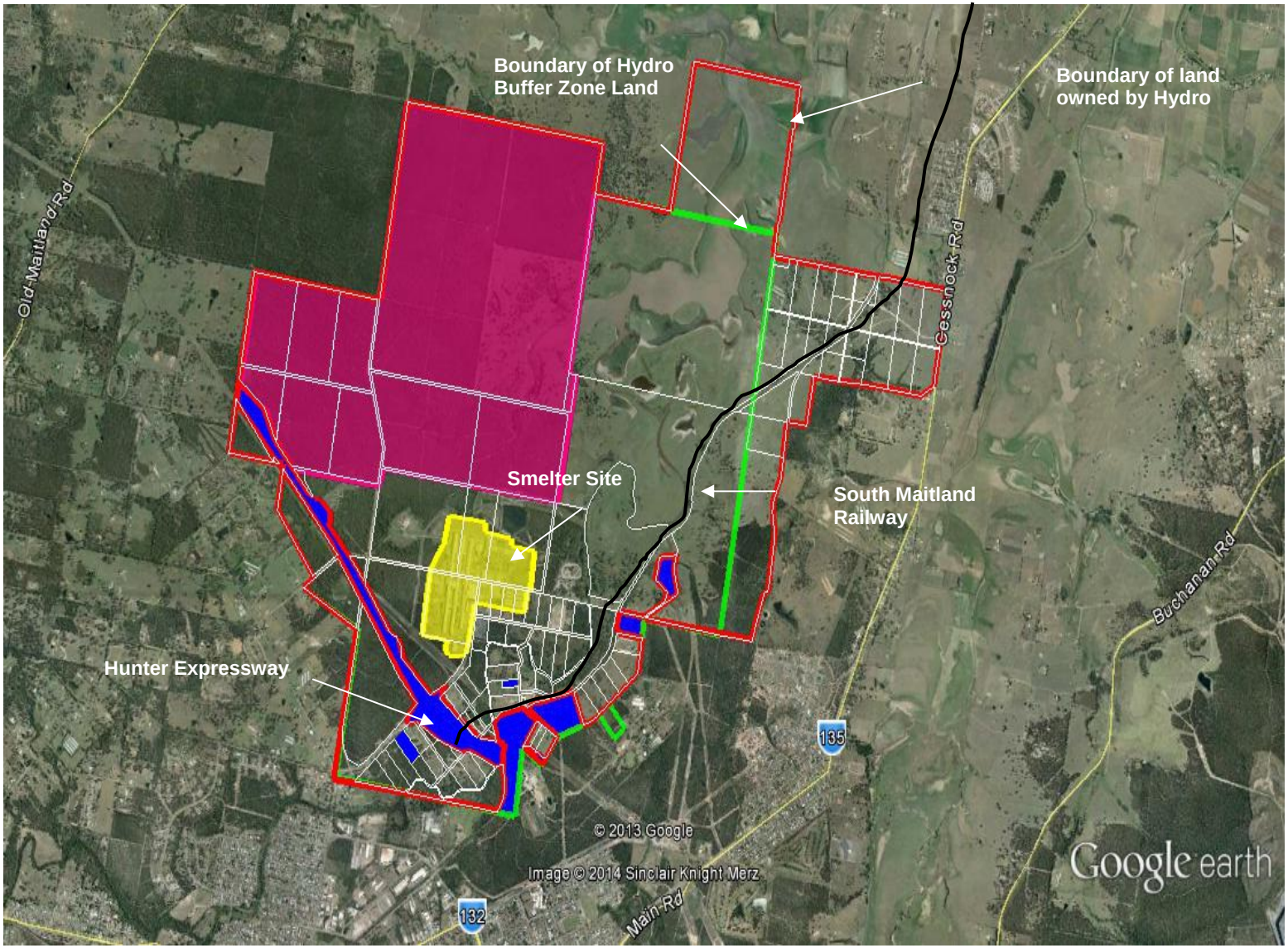
ENVIRON did not independently verify all of the written or oral information provided to ENVIRON during the course of this investigation. While ENVIRON has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to ENVIRON was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

11.1 User Reliance

This report has been prepared exclusively for Hydro Aluminium Kurri Kurri Pty Ltd and may not be relied upon by any other person or entity without ENVIRON's express written permission.

Figures



Approximate Location of Smelter

Approximate Location of Buffer Zone

Land not owned by Hydro

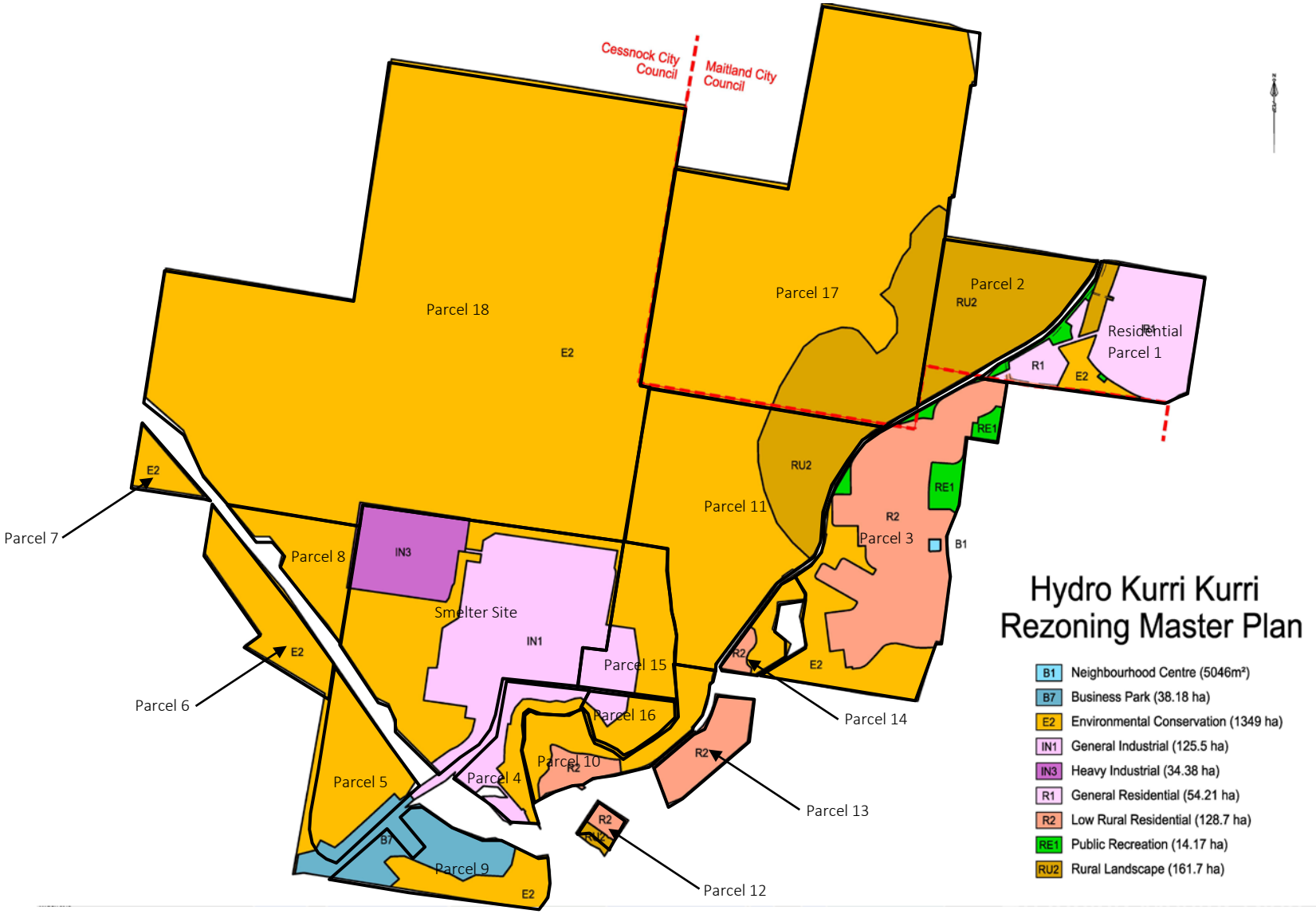
Parcel 18

N

Google Earth Pro: Licence valid till 5/2/15.

Hydro Aluminium Kurri Kurri – Phase 2 Environmental Site Assessment | Site Location

ENVIRON | JOB NO: AS130348 | DATE: May 2014 | FIGURE 1



Proposed Land Zonings taken from
Hydro Kurri Kurri Preliminary Masterplan dated 26/3/15

Hydro Aluminium Kurri Kurri – Phase 2 Buffer Zone investigations

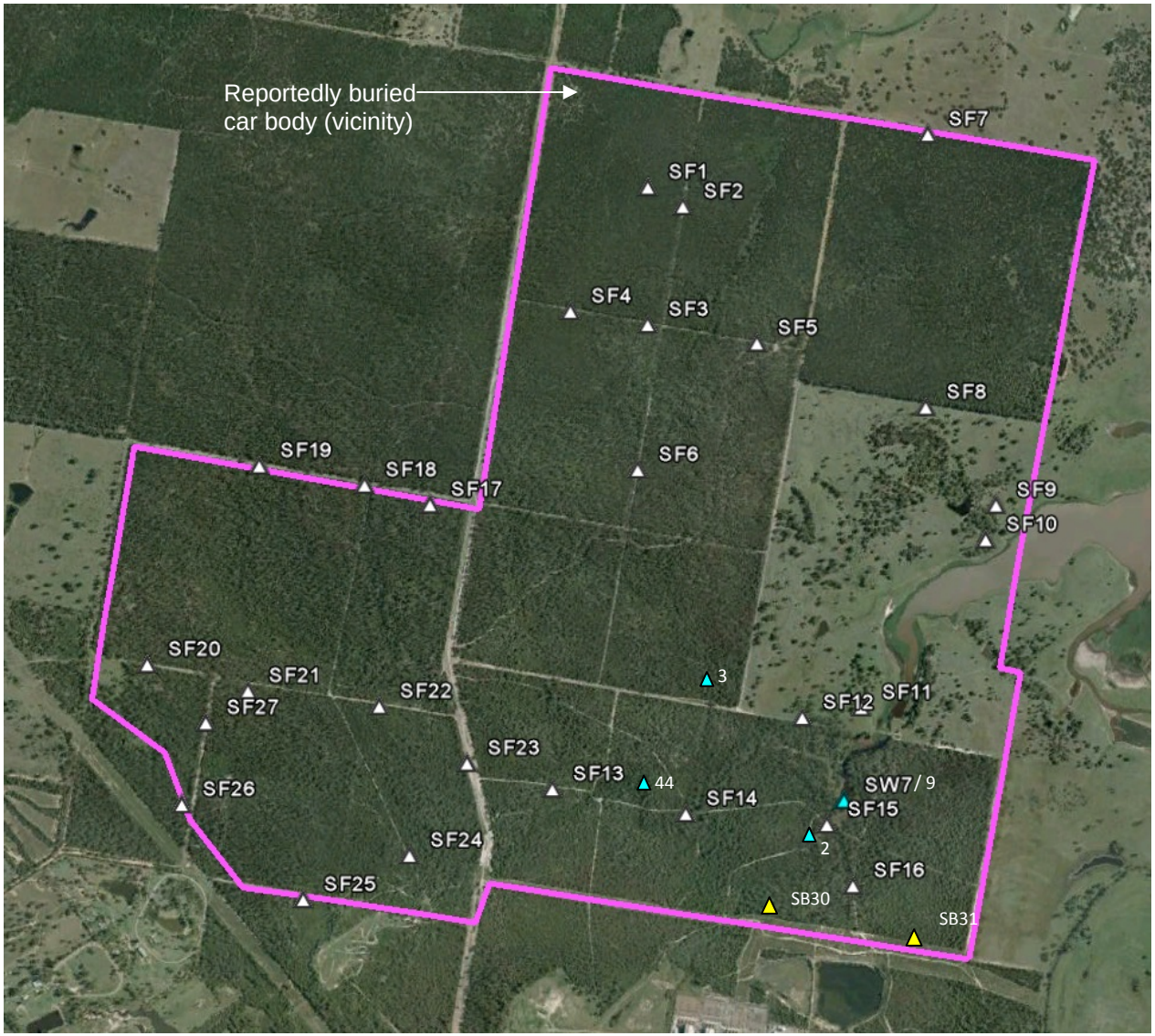
Land Parcels and Proposed Land Zoning

ENVIRON

JOB NO: AS 130348

DATE: March 2015

FIGURE 2



KEY:

- Site Boundary
- SF — Soil Sample for Fluoride Analysis
- Surface water
- SB — Fluoride Soil Sample from ENVIRON (2012)

N

Google Earth Pro: Licenced til 5/2/15

Hydro Aluminium Kurri Kurri – Phase 2 Environmental Site Assessment	Parcel 18 – Soil and Surface Water Sampling Locations

ENVIRON

JOB NO: AS130348

DATE: May 2014

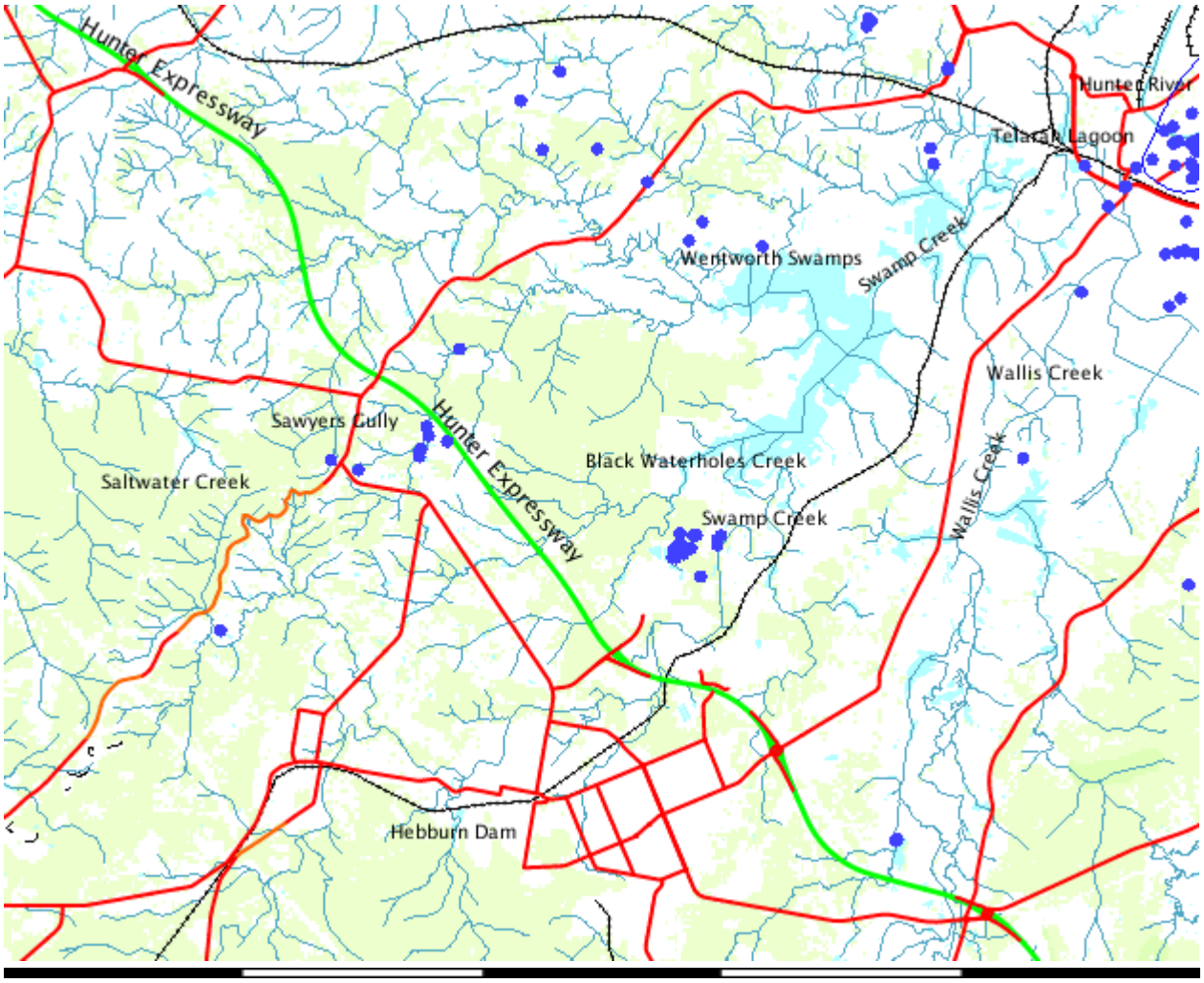
FIGURE 3

Appendix A

Surrounding Groundwater Bores

Groundwater Bores near Parcel 18

Map created with NSW Natural Resource Atlas - http://www.nratlas.nsw.gov.au
Monday, January 13, 2014



0 16 Km

Legend

Symbol	Layer	Custodian
	Cities and large towns	
Cowra	Populated places	
	Towns	
	Groundwater Bores	
	Catchment Management Authority boundaries	
	Major rivers	
Primary/arterial road Motorway/freeway Railway Runway Contour Background	Topographic base map	

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079088

Works Details (top)

GROUNDWATER NUMBER	GW079088
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371306.00
EASTING	358054.00
LATITUDE	32 47' 13"
LONGITUDE	151 29' 3"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079090

Works Details (top)

GROUNDWATER NUMBER	GW079090
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371368.00
EASTING	358105.00
LATITUDE	32 47' 11"
LONGITUDE	151 29' 5"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079092

Works Details (top)

GROUNDWATER NUMBER	GW079092
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371429.00
EASTING	358078.00
LATITUDE	32 47' 9"
LONGITUDE	151 29' 4"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079093

Works Details (top)

GROUNDWATER NUMBER	GW079093
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371460.00
EASTING	358078.00
LATITUDE	32 47' 8"
LONGITUDE	151 29' 4"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079094

Works Details (top)

GROUNDWATER NUMBER	GW079094
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371462.00
EASTING	358234.00
LATITUDE	32 47' 8"
LONGITUDE	151 29' 10"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079096

Works Details (top)

GROUNDWATER NUMBER	GW079096
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371707.00
EASTING	358152.00
LATITUDE	32 47' 0"
LONGITUDE	151 29' 7"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079097

Works Details (top)

GROUNDWATER NUMBER	GW079097
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371679.00
EASTING	358335.00
LATITUDE	32 47' 1"
LONGITUDE	151 29' 14"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079099

Works Details (top)

GROUNDWATER NUMBER	GW079099
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371003.00
EASTING	358448.00
LATITUDE	32 47' 23"
LONGITUDE	151 29' 18"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079101

Works Details (top)

GROUNDWATER NUMBER	GW079101
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371680.00
EASTING	358387.00
LATITUDE	32 47' 1"
LONGITUDE	151 29' 16"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079102

Works Details (top)

GROUNDWATER NUMBER	GW079102
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371685.00
EASTING	358725.00
LATITUDE	32 47' 1"
LONGITUDE	151 29' 29"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079103

Works Details (top)

GROUNDWATER NUMBER	GW079103
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371530.00
EASTING	358675.00
LATITUDE	32 47' 6"
LONGITUDE	151 29' 27"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Appendix B

Data From Previous Reports

TABLE B-1 Soil Analytical Results for the Buffer Zone

Sample Identification	PQL	Guideline			SB30	SB31
Sample Depth (m)		HIL 'A' [A]	S/Stn [B]	EILs [C]	0-0.05	0-0.05
Date					12/04/2012	12/04/2012
Sample Profile					TOPSOIL	TOPSOIL
PAEC Sampled					General	General
Sample collected by					FR	FR
Metals						
Aluminium	50		--		9500	2220
Arsenic	1	100	--	20	3.8	0.4
Cadmium	0.1	20	--	3	<0.1	0.1
Chromium	1	100	--	1	15.6	2.3
Copper	2	1000	--	100	0.9	1.8
Nickel	1	600	--	NA	4.4	4.4
Lead	2	300	--	600	10.8	12.4
Zinc	5	7000	--	200	8.3	10.8
Mercury	0.05	15	--	1	<0.1	<0.1
Fluoride	40	400*	--		110	120

All results are in units of mg/kg.

Blank Cell indicates testing was not completed

PQL = Practical Quantitation Limit.

[A] NEPM 1999 HIL 'A' (Low Density Residential)

[B] NSWEPA Guidelines for Assessing Service Station Sites, 1994

[C] NEPC NEPM Schedule B (1) 1999. Table 5-A, EILs

Guidelines reported for Chromium are for Chromium VI

Results shown in shading are in excess of the primary acceptance criteria: HIL "A" or the Service Station Guidelines

TABLE B-2 Surface Water Analytical Results

Sample Identification	PQL	Guideline			SW7	SW7
Date		95% Fresh [A]	Irrigation	Stock	9/8/12	28/9/12
Depth to Water (mAHD)					Surface	Surface
Sample Appearance					Clear	Clear
Sample collected by					KJG	SC
Analytes						
pH		6.5-8			6.7	5.9
Electrical Conductivity			4500-7700		1500	2600
Soluble Fluoride	0.1	1.5 *	1	2	3.7	3.5
Total Cyanide	0.004				0.026	0.16
Free Cyanide	0.004		0.007		0.007	<0.004
Total Aluminium pH>6.5	0.01	9 *	5	5	150 ~	1.1
Calcium	0.5				15	29
Potassium	0.5				6.3	7.8
Sodium	0.5				230	460
Magnesium	0.5				30	68
Hydroxide Alkalinity	5				<5	<5
Bicarbonate Alkalinity	5				19	18
Cabonate Alkalinity	5				<5	<5
Total Alkalinity	5				19	18
Sulphate	1				43	150
Chloride	1				400	740
Ionic Balance	%				2.9	5.7

All results in mg/L

PQL = Practical Quantitation Limit.

[A] ANZECC 2000 95% Protection Level for Receiving Water Type

Guidelines in *italics* are low level reliability guidelines

* based on site specific recreational guideline (ENVIRON 2013)

NHMRC guidelines for total cyanide are based on cyanogen chloride (as cyanide).

Results shaded grey are in excess of the primary acceptance criteria: ANZECC 95%, NHMRC

~ Result considered anomalous

Table B3 Surface Water Quality around the Hydro Aluminium Kurri Kurri Smelter for 2013

MONTH		2	9
January	pH	5.1	dry
	Conductivity (uS/cm)	5200	dry
	Fluoride (mg/L)	5.1	dry
February	pH		5.8
	Conductivity (uS/cm)		970
	Fluoride (mg/L)		3.5
March	pH		6.7
	Conductivity (uS/cm)		230
	Fluoride (mg/L)		0.6
	Free Cyanide (mg/L)		
April	pH	6.9	6.8
	Conductivity (uS/cm)	1100	740
	Fluoride (mg/L)	2.8	2.0
May	pH		6.2
	Conductivity (uS/cm)		930
	Fluoride (mg/L)		2.7
June	pH		4.6
	Conductivity (uS/cm)		1200
	Fluoride (mg/L)		2.9
	Free Cyanide (mg/L)		
July	pH	6.6	5.3
	Conductivity (uS/cm)	1000	1300
	Fluoride (mg/L)	2.6	5.3
August	pH		4.5
	Conductivity (uS/cm)		1400
	Fluoride (mg/L)		2.5
September	pH		4.0
	Conductivity (uS/cm)		1700
	Fluoride (mg/L)		2.0
	Free Cyanide (mg/L)		
October	pH	6.6	3.8
	Conductivity (uS/cm)	2800	2300
	Fluoride (mg/L)	3.2	2.8
November	pH		
	Conductivity (uS/cm)		
	Fluoride (mg/L)		
December	pH		
	Conductivity (uS/cm)		
	Fluoride (mg/L)		
	Free Cyanide (mg/L)		

Appendix C

Site Photographs

Photo 1: Eucalypts and dense scrubland in the vicinity of soil sampling site SF6.

Photo 2: Photograph of grass pasture and creek in the vicinity of soil sampling site SF15.

Photo 3: Photograph of woodland in the vicinity of soil sampling site SF8.

Appendix D

Field Investigation Sheets

Site Walkover Checklist

23/10/13 11:00 - 14:00

Project No.:	AS130348	**Date and Time:**	24/10/13 10:30 - 13:00
Land Parcel:	EC02	**Weather:**	Dry, high 20°C, wind 6-8 m/s
Lot and DP:	Lot 1 DP166625	**Environ Personnel:**	M. Manditch

Site Description

Topography	Sloping to SE corner. Woodland mainly. Some open grassland
Surface Geology	Some compressed soil, some loose brown soil heavy leaf litter.
Fill evident?	No
Hummocky ground?	No
Structures on site?	No
Location of structures	N/A
Building materials used in structures	N/A
Asbestos debris on site?	None identified
Location of asbestos debris?	N/A
Volume of asbestos debris?	N/A

GPS Locations of Interest

Point of Interest	Easting	Northing
Entry to site - off James Lane	-32.757733	151.474050

Description of Photographs Taken

- Soil sample sites - 1574 → 1583, 87, 89, 91, 92, 94, 98 → 1601
- 1603, 1605, 1607 → 17, 1619, 21 → 29
- Photos of typical vegetation and topography 1584, 85, 88, 90, 95 → 97, 1602, 1604, 1606, 1618, 1620
- Dead fish upstream of waterbody 1593!

Miscellaneous Field Comments

Work performed over 2 days due to bushfire risk and resultant traffic problems in the area.
10 x 10m walkover -32.776011° 151.482008°
Glenn from Hydro as escort.
27 soil samples for fluoride analysis collected.

M. Manditch.

ENVIRON

PROJECT SAMPLE REGISTER

Eco2

Project No AS130348	Project Name Hydro	Date commenced 23/10/13
Location Kurri Kurri	Refer to Daily log for weather details	Date completed 24/10/13

#	Sample Name	Sampled by	Easting	Northing	Depth mm	Description (soil type, moisture, colour, foreign content, signs of contamination) or 'refer to log'	Quality Assurance	Comments (eg lab analyse)
1	ECO2 - SF1	MM	32. 76092	151. 47699	10	same vegetation, Trees dry, loose		
2	ECO2 - SF2		32. 76149	151. 47823	5 ~~10~~ mm	leaf mulch, dry. Tree area		
3	ECO2 - SF3		32. 76501	151. 47698	10	Heavy treed. scrub Heavy leaf litter. Sawn timber adjacent.		
4	ECO2 - SF4		32. 76463	151. 47425	5	as per SF2 Shallow layer, loose soil.		
5	- SF5		32. 76555	151. 48085	5	as per SF2. Charcoal. Very shallow layer soil.		
6	- SF6		32. 76932	151. 47663	15	going up slope. leaf litter, similar SF3 with heavy scrub.		
7	- SF7		32. 75934	151. 48690	15	Trees, heavy dry grass cover Little exposed soil.		
8	- SF8		32. 76~~8~~746	151. 48682	15	Trees, less scrub than other sites SF1-7. some exposed soil. Loose soil, leaf litter.		
9	- SF9		32. 77036	151. 48939	10	Pasture area, shallow soil sampled around root zone.		
10	- SF10	↓	32. 77139	151. 48903	15	Drainage line. Dead carp Pasture. Creek bottom. Heavy flooding 10 months ago.	Dup 1	

Signed MK

Date 25/10/13

ENVIRON

PROJECT SAMPLE REGISTER

Eco2

Project No AS130348	Project Name Hydro	Date commenced 23/10/13
Location Kurri Kurri	Refer to Daily log for weather details	Date completed 24/10/13

#	Sample Name	Sampled by	Easting	Northing	Depth mm	Description (soil type, moisture, colour, foreign content, signs of contamination) or 'refer to log'	Quality Assurance	Comments (eg lab analyse)
1	ECO2 – SF11	MM	32. 77641	151. 48460	10	Pasture, drainage line to wetland. Above water mark Trees		
2	– SF12		32. 77670	151. 48249	5	Dry pasture. Open level ground. Root zone. Loose soil		
3	– SF13		32. 77884	151. 47861	10	Some trees. Heavy scrub and undergrowth. Leaf litter		
4	– SF14		32. 77957	151. 47835	10	Creek bed. No water. Pine needles Some eucalypts. Leaf litter		
5	–SF15		32. 77990	151. 48337	10	Adjacent to creek bed out of Some eucalypts flooding zone. Green grass. More open.		
6	– SF16		32. 78171	151. 48428	10	Scrub and heavily treed.	Dup 2	
24/10 7	– SF17		32. ~~78173~~	151. ~~48426~~	10	Heavy scrub & trees. Leaf litter Pine needles		GPS reading incorrect?
8	– SF18		32. 76978	151. 46700	5	Heavy scrub & trees. Compressed ground. Clay. Possible waterway		
9	– SF19		32. 76924	151. 46329	10	Down slope to creek. Heavy scrub & trees. Pine needles. Leaf litter.		
10	– SF20		32. 77509	151. 45933	5	Mod scrub & tree coverage. Grass & leaf litter. Loose soil.		

Signed MA

Date 25/10/13

Eco 2 24/10/13

#	Sample Name	Sampled by	Easting	Northing	Depth	Description (soil type, moisture, colour, foreign content, signs of contamination) or 'refer to log'	Quality Assurance	Comments (eg lab analyse)
	ECO2 - SF 21	MM	32. 77588	151. 46286	5	Loose soil. Leaf litter. Several large gums. Moderate scrub.		
	- SF22	|	32. 77636	151. 46747	5	No large trees. Small eucalypts. Leaf litter and scrub. Sandy soil. Compressed		
	- SF23	|	32. 77806	151. 47058	5 compacted	Hydro stack visible. Scrub e sparse grass coverage. Sandy grass. Medium trees. Low tree coverage. Less leaf litter. Dup 3		
	- SF24	|	32. 78081	151. 46854	10	Paperbark trees e scrub. Loose sandy soil. Mod leaf litter. Fire scorched trees. Scrub has regrown.		
	- SF25	|	32. 78212	151. 46477	5 compact	Mod dense scrub. Lichen. Some leaf litter. No sand at this site.		
	- SF26	|	32. 78008	151. 46067	10	Mod coverage eucalypts e scrub. Leaf litter. Sandy soil. Edge of Hunter expressway.		GPS reading at corner of block
	- SF27	↓	32. 77683	151. 46136	10	Mod coverage eucalypts. Heavy scrub. No sand. Lichen		

Signed _____ Date _____

Appendix E

Results Tables

TABLE D1: Soil Analytical Results - Grid Sampling

Sample Depth: 0.005m - 0.015m

Sampling Date: 24/10/2013

Laboratory PQL: 1 mg/kg

Site Specific HIL - Fluoride: 440mg/kg

Sample Identification	Soluble Fluoride mg/kg (1:5 soil:water)
SF1	<2
SF2	<2
SF3	2
SF4	<1
SF5	2
SF6	<5
SF7	2
SF8	<2
SF9	1
SF10	3
SF11	2
SF12	<1
SF13	6
SF14	3
SF15	26
SF16	2
SF17	2
SF18	<2
SF19	1
SF20	2
SF21	2
SF22	3
SF23	6
SF24	3
SF25	3
SF26	2
SF27	3

TABLE D2: Soil Quality Assurance/ Quality Control Results

Sample Identification	ECO2-SF10	ECO2-DUP1		ECO2-SF116	ECO2-DUP2		ECO2-SF23	ECO2-DUP3	
Sample Depth (m)	0.05-0.01			0.05-0.01			0.05-0.01		
Duplicate Type	Intralaboratory		RPD %	Intralaboratory		RPD %	Intralaboratory		RPD %
Sample Profile	TOPSOIL			TOPSOIL			TOPSOIL		
Sample collected by	MM			MM			MM		
Metals									
Fluoride (1:5 soil:water)	3	4	29	2	2	0	6	6	0

Note all units in mg/kg

BOLD identifies where RPD results

intralaboratory
>50
>75
>100
AD>2.5 * PQL

BOLD identified where blanks >0

Where results are within two of the above ranges the most conservative criteria have been used to assess duplicate

Appendix F

Laboratory Reports

CERTIFICATE OF ANALYSIS

Work Order	: **ES1323786**	Page	: 1 of 8
Client	: **ENVIRON AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 04-NOV-2013
Sampler	: MM	Issue Date	: 11-NOV-2013
Site	: ----		
		No. of samples received	: 30
Quote number	: SY/446/12	No. of samples analysed	: 30

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Nanthini Coilparampil	Laboratory Manager - Inorganics	Sydney Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EK040S: LOR's for some samples have been raised due to insufficient sample amount**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	EC02_SF21	EC02_SF18	EC02_SF2	EC02_SF17	EC02_SF11
			Client sampling date / time	24-OCT-2013 15:00	24-OCT-2013 15:00	23-OCT-2013 15:00	24-OCT-2013 15:00	23-OCT-2013 15:00
Compound	CAS Number	LOR	Unit	ES1323786-001	ES1323786-002	ES1323786-003	ES1323786-004	ES1323786-005
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	**1.8**	**4.2**	**3.1**	**2.2**	<1.0
EK040: Fluoride								
Fluoride	16984-48-8	1	mg/kg	**2**	<2	<2	**2**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	EC02_SFDUP01	EC02_SF20	EC02_SF16	EC02_SF5	EC02_SF7
			Client sampling date / time	23-OCT-2013 15:00	24-OCT-2013 15:00	23-OCT-2013 15:00	23-OCT-2013 15:00	23-OCT-2013 15:00
Compound	CAS Number	LOR	Unit	ES1323786-006	ES1323786-007	ES1323786-008	ES1323786-009	ES1323786-010
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	3.9	3.0	1.4	3.6	5.9
EK040: Fluoride								
Fluoride	16984-48-8	1	mg/kg	4	2	2	2	2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	EC02_SF13	EC02_SF3	EC02_SF26	EC02_SF25	EC02_SF9
			Client sampling date / time	23-OCT-2013 15:00	23-OCT-2013 15:00	24-OCT-2013 15:00	24-OCT-2013 15:00	23-OCT-2013 15:00
Compound	CAS Number	LOR	Unit	ES1323786-011	ES1323786-012	ES1323786-013	ES1323786-014	ES1323786-015
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	2.4	9.7	7.0	3.3	5.1
EK040: Fluoride								
Fluoride	16984-48-8	1	mg/kg	6	2	2	3	1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	EC02_SF12	EC02_SF8	EC02_SF1	EC02_SF15	EC02_SF10
			Client sampling date / time	23-OCT-2013 15:00	23-OCT-2013 15:00	23-OCT-2013 15:00	23-OCT-2013 15:00	23-OCT-2013 15:00
Compound	CAS Number	LOR	Unit	ES1323786-016	ES1323786-017	ES1323786-018	ES1323786-019	ES1323786-020
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	**1.5**	**9.2**	**4.0**	**11.6**	**3.1**
EK040: Fluoride								
Fluoride	16984-48-8	1	mg/kg	<1	<2	<2	**26**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	EC02_SF6	EC02_SFDUP02	EC02_SF4	EC02_SF14	EC02_SF27
			Client sampling date / time	23-OCT-2013 15:00	23-OCT-2013 15:00	23-OCT-2013 15:00	23-OCT-2013 15:00	24-OCT-2013 15:00
Compound	CAS Number	LOR	Unit	ES1323786-021	ES1323786-022	ES1323786-023	ES1323786-024	ES1323786-025
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	6.6	8.7	2.8	15.8	7.4
EK040: Fluoride								
Fluoride	16984-48-8	1	mg/kg	<5	2	<1	3	3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	EC02_SFDUP03	EC02_SF19	EC02_SF24	EC02_SF23	EC02_SF22
			Client sampling date / time	24-OCT-2013 15:00	24-OCT-2013 15:00	24-OCT-2013 15:00	24-OCT-2013 15:00	24-OCT-2013 15:00
Compound	CAS Number	LOR	Unit	ES1323786-026	ES1323786-027	ES1323786-028	ES1323786-029	ES1323786-030
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	5.7	5.3	3.8	2.4	3.9
EK040: Fluoride								
Fluoride	16984-48-8	1	mg/kg	6	1	3	6	3

Analytical Results

Descriptive Results

Sub-Matrix: SOIL

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EK040: Fluoride		
EK040S: Fluoride	EC02_SF10 - 23-OCT-2013 15:00	3

QUALITY CONTROL REPORT

Work Order	: **ES1323786**	Page	: 1 of 4
Client	: **ENVIRON AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 04-NOV-2013
Sampler	: MM	Issue Date	: 11-NOV-2013
Order number	: ----		
		No. of samples received	: 30
Quote number	: SY/446/12	No. of samples analysed	: 30

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out ir compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Nanthini Coilparampil	Laboratory Manager - Inorganics	Sydney Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 3142482)									
ES1323647-004	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	28.6	27.5	3.7	0% - 20%
ES1323786-009	EC02_SF5	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	3.6	5.7	44.0	No Limit
EA055: Moisture Content (QC Lot: 3142483)									
ES1323786-018	EC02_SF1	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	4.0	4.8	18.4	No Limit
ES1323786-029	EC02_SF23	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	2.4	2.4	0.0	No Limit
EK040S: Fluoride Soluble (QC Lot: 3142827)									
ES1323624-001	Anonymous	EK040S: Fluoride	16984-48-8	1	mg/kg	2	2	0.0	No Limit
ES1323624-010	Anonymous	EK040S: Fluoride	16984-48-8	1	mg/kg	2	2	0.0	No Limit
EK040S: Fluoride Soluble (QC Lot: 3142828)									
ES1323786-004	EC02_SF17	EK040S: Fluoride	16984-48-8	1	mg/kg	2	2	0.0	No Limit
ES1323786-013	EC02_SF26	EK040S: Fluoride	16984-48-8	1	mg/kg	2	1	0.0	No Limit
EK040S: Fluoride Soluble (QC Lot: 3142829)									
ES1323786-024	EC02_SF14	EK040S: Fluoride	16984-48-8	1	mg/kg	3	3	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EK040S: Fluoride Soluble (QCLot: 3142827)								
EK040S: Fluoride	16984-48-8	1.0	mg/kg	<1	25.0 mg/kg	111	69	117
EK040S: Fluoride Soluble (QCLot: 3142828)								
EK040S: Fluoride	16984-48-8	1.0	mg/kg	<1	25.0 mg/kg	109	69	117
EK040S: Fluoride Soluble (QCLot: 3142829)								
EK040S: Fluoride	16984-48-8	1.0	mg/kg	<1	25.0 mg/kg	112	69	117

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK040S: Fluoride Soluble (QCLot: 3142827)							
ES1323624-001	Anonymous	EK040S: Fluoride	16984-48-8	25.0 mg/kg	115	70	130
EK040S: Fluoride Soluble (QCLot: 3142828)							
ES1323786-004	EC02_SF17	EK040S: Fluoride	16984-48-8	25.0 mg/kg	116	70	130
EK040S: Fluoride Soluble (QCLot: 3142829)							
ES1323786-024	EC02_SF14	EK040S: Fluoride	16984-48-8	25.0 mg/kg	98.8	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EK040S: Fluoride Soluble (QCLot: 3142827)										
ES1323624-001	Anonymous	EK040S: Fluoride	16984-48-8	25.0 mg/kg	115	----	70	130	----	----
EK040S: Fluoride Soluble (QCLot: 3142828)										
ES1323786-004	EC02_SF17	EK040S: Fluoride	16984-48-8	25.0 mg/kg	116	----	70	130	----	----
EK040S: Fluoride Soluble (QCLot: 3142829)										
ES1323786-024	EC02_SF14	EK040S: Fluoride	16984-48-8	25.0 mg/kg	98.8	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1323786**	Page	: 1 of 7
Client	: ENVIRON AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 04-NOV-2013
Sampler	: MM	Issue Date	: 11-NOV-2013
Order number	: ----		
		No. of samples received	: 30
Quote number	: SY/446/12	No. of samples analysed	: 30

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Pulp Bag (EA055-103)							
EC02_SF2, EC02_SF11, EC02_SFDUP01, EC02_SF16, EC02_SF5, EC02_SF7, EC02_SF13, EC02_SF3, EC02_SF9, EC02_SF12, EC02_SF8, EC02_SF1, EC02_SF15, EC02_SF10, EC02_SF6, EC02_SFDUP02, EC02_SF4, EC02_SF14	**23-OCT-2013**	**----**	----	----	**05-NOV-2013**	06-NOV-2013	✓
Pulp Bag (EA055-103)							
EC02_SF21, EC02_SF18, EC02_SF17, EC02_SF20, EC02_SF26, EC02_SF25, EC02_SF27, EC02_SFDUP03, EC02_SF19, EC02_SF24, EC02_SF23, EC02_SF22	**24-OCT-2013**	**----**	----	----	**05-NOV-2013**	07-NOV-2013	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK040: Fluoride							
Pulp Bag (EK040S)							
EC02_SF2, EC02_SF11, EC02_SFDUP01, EC02_SF16, EC02_SF5, EC02_SF7, EC02_SF13, EC02_SF3, EC02_SF9, EC02_SF12, EC02_SF8, EC02_SF1, EC02_SF15, EC02_SF10, EC02_SF6, EC02_SFDUP02, EC02_SF4, EC02_SF14	**23-OCT-2013**	**06-NOV-2013**	30-OCT-2013	×	**06-NOV-2013**	04-DEC-2013	✓
Pulp Bag (EK040S)							
EC02_SF21, EC02_SF18, EC02_SF17, EC02_SF20, EC02_SF26, EC02_SF25, EC02_SF27, EC02_SFDUP03, EC02_SF19, EC02_SF24, EC02_SF23, EC02_SF22	**24-OCT-2013**	**06-NOV-2013**	31-OCT-2013	×	**06-NOV-2013**	04-DEC-2013	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Fluoride - Soluble	EK040S	5	47	**10.6**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Moisture Content	EA055-103	4	40	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Fluoride - Soluble	EK040S	3	47	**6.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Fluoride - Soluble	EK040S	3	47	**6.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Fluoride - Soluble	EK040S	3	47	**6.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Fluoride - Soluble	EK040S	SOIL	APHA 21st ed., 4500 F--C Soluble Fluoride is determined after a 1:5 soil/water extract using an ion selective electrode.

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **SOIL**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EK040: Fluoride							
Pulp Bag							
EC02_SF2,	EC02_SF11,	06-NOV-2013	30-OCT-2013	**7**	----	----	----
EC02_SFDUP01,	EC02_SF16,						
EC02_SF5,	EC02_SF7,						
EC02_SF13,	EC02_SF3,						
EC02_SF9,	EC02_SF12,						
EC02_SF8,	EC02_SF1,						
EC02_SF15,	EC02_SF10,						
EC02_SF6,	EC02_SFDUP02,						
EC02_SF4,	EC02_SF14						
Pulp Bag							
EC02_SF21,	EC02_SF18,	06-NOV-2013	31-OCT-2013	**6**	----	----	----
EC02_SF17,	EC02_SF20,						
EC02_SF26,	EC02_SF25,						
EC02_SF27,	EC02_SFDUP03,						
EC02_SF19,	EC02_SF24,						
EC02_SF23,	EC02_SF22						

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **ES1323786**		
Client	: **ENVIRON AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	Page	: 1 of 4
Order number	: ----		
C-O-C number	: ----	Quote number	: ES2012ENVIAUS0307 (SY/446/12)
Site	: ----		
Sampler	: MM	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 04-NOV-2013	Issue Date	: 05-NOV-2013 09:04
Client Requested Due Date	: 11-NOV-2013	Scheduled Reporting Date	: **11-NOV-2013**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 5.2' C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 30
Security Seal	: Intact.	No. of samples analysed	: 30

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method / Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
EA055-103 : Moisture Content		
EC02_SF21	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF18	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF2	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF17	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF11	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SFDUP01	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF20	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF16	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF5	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF7	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF13	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF3	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF26	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF25	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF9	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF12	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF8	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF1	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF15	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF10	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF6	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SFDUP02	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF4	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF14	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF27	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SFDUP03	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF19	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF24	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF23	- Pulp Bag	- Soil Glass Jar - Unpreserved
EC02_SF22	- Pulp Bag	- Soil Glass Jar - Unpreserved

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EK040S Fluoride Soluble
ES1323786-001	24-OCT-2013 15:00	EC02_SF21	✓	✓
ES1323786-002	24-OCT-2013 15:00	EC02_SF18	✓	✓
ES1323786-003	23-OCT-2013 15:00	EC02_SF2	✓	✓
ES1323786-004	24-OCT-2013 15:00	EC02_SF17	✓	✓
ES1323786-005	23-OCT-2013 15:00	EC02_SF11	✓	✓
ES1323786-006	23-OCT-2013 15:00	EC02_SFDUP01	✓	✓
ES1323786-007	24-OCT-2013 15:00	EC02_SF20	✓	✓
ES1323786-008	23-OCT-2013 15:00	EC02_SF16	✓	✓
ES1323786-009	23-OCT-2013 15:00	EC02_SF5	✓	✓
ES1323786-010	23-OCT-2013 15:00	EC02_SF7	✓	✓
ES1323786-011	23-OCT-2013 15:00	EC02_SF13	✓	✓
ES1323786-012	23-OCT-2013 15:00	EC02_SF3	✓	✓

			SOIL - EA055-103 Moisture Content	SOIL - EK040S Fluoride Soluble
ES1323786-013	24-OCT-2013 15:00	EC02_SF26	✓	✓
ES1323786-014	24-OCT-2013 15:00	EC02_SF25	✓	✓
ES1323786-015	23-OCT-2013 15:00	EC02_SF9	✓	✓
ES1323786-016	23-OCT-2013 15:00	EC02_SF12	✓	✓
ES1323786-017	23-OCT-2013 15:00	EC02_SF8	✓	✓
ES1323786-018	23-OCT-2013 15:00	EC02_SF1	✓	✓
ES1323786-019	23-OCT-2013 15:00	EC02_SF15	✓	✓
ES1323786-020	23-OCT-2013 15:00	EC02_SF10	✓	✓
ES1323786-021	23-OCT-2013 15:00	EC02_SF6	✓	✓
ES1323786-022	23-OCT-2013 15:00	EC02_SFDUP02	✓	✓
ES1323786-023	23-OCT-2013 15:00	EC02_SF4	✓	✓
ES1323786-024	23-OCT-2013 15:00	EC02_SF14	✓	✓
ES1323786-025	24-OCT-2013 15:00	EC02_SF27	✓	✓
ES1323786-026	24-OCT-2013 15:00	EC02_SFDUP03	✓	✓
ES1323786-027	24-OCT-2013 15:00	EC02_SF19	✓	✓
ES1323786-028	24-OCT-2013 15:00	EC02_SF24	✓	✓
ES1323786-029	24-OCT-2013 15:00	EC02_SF23	✓	✓
ES1323786-030	24-OCT-2013 15:00	EC02_SF22	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)	Container			Date	Evaluation	Date	Evaluation
EK040S: Fluoride - Soluble							
EC02_SF10	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF11	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF12	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF13	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF14	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF15	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF16	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF17	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF18	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF19	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF1	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF20	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF21	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF22	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF23	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF24	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF25	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF26	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF27	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF2	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF3	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF4	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF5	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF6	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF7	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF8	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SF9	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SFDUP01	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SFDUP02	Pulp Bag	30-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×
EC02_SFDUP03	Pulp Bag	31-OCT-2013	----	04-NOV-2013	×	04-NOV-2013	×

Requested Deliverables

MR STEVE CADMAN

- *AU Certificate of Analysis - NATA (COA)	Email	scadman@environcorp.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	scadman@environcorp.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	scadman@environcorp.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN	Email	scadman@environcorp.com
- A4 - AU Tax Invoice (INV)	Email	scadman@environcorp.com
- Chain of Custody (CoC) (COC)	Email	scadman@environcorp.com
- EDI Format - ENMRG (ENMRG)	Email	scadman@environcorp.com
- EDI Format - ESDAT (ESDAT)	Email	scadman@environcorp.com

CHAIN OF CUSTODY

ALS Laboratory: please tick →

[ ] Sydney 277 Woodpark Rd Smithfield NSW 2176 Ph 02 8784 8555 E samples.sydney@alsenviro.com
[ ] Newcastle: 5 Rosegum Rd Wallsbrook NSW 2304 Ph 02 4968 9433 E samples.newcastle@alsenviro.com
[ ] Brisbane 32 Shand St, Stafford QLD 4053 Ph 07 3243 7222 E samples.brisbane@alsenviro.com
[ ] Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E townsville.environmental@alsenviro.com
[ ] Melbourne 2-4 Westall Rd Springvale VIC 3171 Ph 03 8549 9600 E samples.melbourne@alsenviro.com
[ ] Adelaide: 2-1 Burma Rd Pooraka SA 5095 Ph 08 8359 0890 E adelaide@alsenviro.com
[ ] Perth 10 Hod Way, Malaga WA 6090 Ph 08 9209 7655 E samples.perth@alsenviro.com
[ ] Launceston: 27 Wellington St, Launceston TAS 7250 Ph 03 6331 2158 E launceston@alsenviro.com

11/11/13

CLIENT: ENVIRON	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	[✓] Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle): Custody Seal Intact? Yes / No / N/A
OFFICE: The Junction		[ ] Non Standard or urgent TAT (List due date):	Free ice / frozen ice bricks present upon receipt? Yes / No / N/A
PROJECT: AS130348 PROJECT NO.:	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: (1) 2 3 4 5 6 7	Random Sample Temperature on Receipt: 8.9 °C
ORDER NUMBER: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:	OF: 1 2 (3) 4 5 6 7	Other comments:
PROJECT MANAGER: Steve Cadman CONTACT PH: 0249625444			
SAMPLER: Michelle Mandlitch SAMPLER MOBILE:			
COC Emailed to ALS? (YES / (NO) EDD FORMAT (or default):			
Email Reports to (will default to PM if no other addresses are listed): scadman@environcorp.com			
Email Invoice to (will default to PM if no other addresses are listed): "			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 4/11/13 10:50am	DATE/TIME: 4/11/13 1050	DATE/TIME: 4/11/13 1700	DATE/TIME: 4-11-13 19:25

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Soluble Fluoride								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	ECO2-SF21	24/10/13	S	unpreserved paper	1	X								
2	ECO2-SF18	24/10/13				X								
3	ECO2-SF2	23/10/13				X								
4	ECO2-SF17	24/10/13				X								
5	ECO2-SF11	23/10/13				X								
6	ECO2-SFDUP1	23/10/13				X								
7	ECO2-SF20	24/10/13				X								
8	ECO2-SF16	23/10/13				X								
9	ECO2-SF5	23/10/13				X								
10	ECO2-SF7	23/10/13				X								
11	ECO2-SF13	23/10/13				X								
12	ECO2-SF3	23/10/13				X								
					TOTAL	12	12							

Environmental Division
Sydney
Work Order
ES1323786

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd Smithfield NSW 2176 Ph 02 8784 8555 E: samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd Warabrook NSW 2304 Ph 02 4968 9433 E: samples.newcastle@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph 07 3243 7222 E: samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd Springvale VIC 3171 Ph 03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd Pooraka SA 5095 Ph 08 8359 0890 E: adelaide@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph 03 6331 2158 E: launceston@alsenviro.com

CLIENT: ENVIRON	TURNAROUND REQUIREMENTS: ☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle):	
OFFICE: The Junction	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	(Yes) No N/A
PROJECT: AS130348 PROJECT NO.:	ALS QUOTE NO.:	Free ice / frozen ice bricks present upon receipt?	(Yes) No N/A
ORDER NUMBER: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:	Random Sample Temperature on Receipt:	5.1 °C
PROJECT MANAGER: Steve Cadman CONTACT PH: 0249624444	COC SEQUENCE NUMBER (Circle) COC: 1 (2) 3 4 5 6 7	Other comments:	
SAMPLER: Michelle Mandich SAMPLER MOBILE:	OF: 1 2 (3) 4 5 6 7		
COC Emailed to ALS? (YES (NO) EDD FORMAT (or default):			
Email Reports to (will default to PM if no other addresses are listed): scadman@environcorp.com			
Email Invoice to (will default to PM if no other addresses are listed): "			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
KWoods	EZ	IOL	Ravinesh
DATE/TIME: 4/11/13 11:00am	DATE/TIME: 4/11/13 1100	DATE/TIME: 4/11/13 1700	DATE/TIME: 4.11.13 19:25

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Soluble Fluoride								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	ECO2-SF26	24/10/13	S	unpreserved paper	1	X								
14	ECO2-SF25	24/10/13				X								
15	ECO2-SF9	23/10/13				X								
16	ECO2-SF12	23/10/13				X								
17	ECO2-SF8	23/10/13				X								
18	ECO2-SF1	23/10/13				X								
19	ECO2-SF15	23/10/13				X								
20	ECO2-SF10	23/10/13				X								
21	ECO2-SF6	23/10/13				X								
22	ECO2-SFDUP2	23/10/13				X								
23	ECO2-SF4	23/10/13				X								
24	ECO2-SF14	23/10/13				X								
				TOTAL	12	12								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugol's Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney 277 Woodpark Rd Smithfield NSW 2176 Ph 02 8784 8555 E:samples.sydney@alsenviro.com
☐ Brisbane 32 Shand St Stafford QLD 4053 Ph 07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Melbourne 2-4 Westall Rd Springvale VIC 3171 Ph 03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Perth 10 Hod Way, Malaga WA 6090 Ph 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd Warabrook NSW 2304 Ph 02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd Pooraka SA 5095 Ph 08 8359 0890 E:adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph 03 6331 2158 E: launceston@alsenviro.com

CLIENT: ENVIRON	TURNAROUND REQUIREMENTS: ☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE: The Junction	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes / No / N/A
PROJECT: AS130348 PROJECT NO.:	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes / No / N/A
ORDER NUMBER: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:	COC: 1 2 (3) 4 5 6 7	Random Sample Temperature on Receipt: 8.4 °C
PROJECT MANAGER: Steve Cadman CONTACT PH: 02 49825444		OF: 1 2 (3) 4 5 6 7	Other comments:
SAMPLER: Michelle Mandifich SAMPLER MOBILE:			
COC Emailed to ALS? (YES (NO) EDD FORMAT (or default):			
Email Reports to (will default to PM if no other addresses are listed): scadman@environcorp.com			
Email Invoice to (will default to PM if no other addresses are listed): "			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 4/11/13 11:00am	DATE/TIME: 4/11/13 1100	DATE/TIME: 4/11/13 1700	DATE/TIME: 4-11-13 19.25

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Soluble Fluoride								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
25	EC02-SF27	24/10/13	S	unpreserved paper	1	X								
26	EC02-SFDUP3	24/10/13	↓	↓	1	X								
27	EC02-SF19	↓	↓	↓	1	X								
28	EC02-SF24	↓	↓	↓	1	X								
29	EC02-SF23	↓	↓	↓	1	X								
30	EC02-SF22	↓	↓	↓	1	X								
				TOTAL	6	6								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Appendix G

QA/QC Assessment

APPENDIX G

DATA QUALITY OBJECTIVES

To ensure that reliable data of adequate type was collected and assessed for the investigation, the seven-step Data Quality Objective (DQO) approach, endorsed in the NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme 2nd Edition, will be adopted. The DQOs set quality assurance and quality control parameters for the field and laboratory programs to ensure data of appropriate reliability will be used to assess the environmental conditions at Parcel 18.

ENVIRON has developed DQOs in accordance with the seven-step process, which is presented below.

Step 1 – State the Problem

Based on the information available from the Phase 1 ESA (ENVIRON 2013b), uses of Parcel 18 appear to be limited to a farm used for the husbandry of cattle and other animals. The remainder of Parcel 18 is a low lying wetland. These uses of Parcel 18 require confirmation via a site walkover and judgemental sampling. In addition, the potential for fluoride in surface soils from dust deposition from the Hydro smelter requires assessment.

Step 2 – Identification of the Goals (Decisions) of the Study

The following decisions are to be made from this study:

- Are the current and former uses of Parcel 18 consistent with site observations?
- Has Parcel 18 been impacted by fluoride from dust deposition from the Hydro smelter?
- Has Parcel 18 been impacted by asbestos containing materials?
- Is Parcel 18 suitable for environmental conservation landuse?

Step 3 – Identify Information Inputs to the Decision or Goal of the Study

The inputs required to make the above decisions are listed below:

- A site walkover, including collection of field notes and photographs;
- Results of surface soil samples collected for fluoride analysis;
- Proposed land use;
- Appropriate NSW contamination guidelines.

Step 4 – Define the Study Boundaries

Spatial boundaries - the study boundaries have been defined as the spatial boundary of Parcel 18, as shown on Figure 1.

Vertical boundaries – as areas of concern at Parcel 18 are restricted to surface soils, the vertical boundary of the study is the top 200mm unless subsurface contamination issues are identified during the site walkover.

Temporal boundaries – the temporal boundary is limited to the data collected during the investigation works.

Constraints within the study boundaries – This investigation does not require investigation of subsurface soils or groundwater unless impacts to subsurface soils or groundwater are considered likely to have occurred from the historical site activities

Step 5 – Develop a Decision Rule

The decision rules for this investigation are as follows:

- If it is determined that the data generated through this investigation is reliable for use in producing a site conceptual model and assessing the suitability of Parcel 18 for environmental conservation landuse, then an assessment of the suitability of Parcel 18 for environmental conservation landuse will be made;

- If it is determined that the data generated through this investigation is not suitable, comprehensive or reliable for use in producing a site conceptual model, then further investigations may be recommended prior to the development of a site conceptual model and assessment of the suitability of Parcel 18 for environmental conservation landuse.

Step 6 – Specify Performance or Acceptance Criteria that the Data need to Achieve

Acceptable limits on decision errors have been developed based on the Data Quality Indicators (DQIs) of precision, accuracy, representativeness, comparability and completeness. The DQIs for this investigation are outlined below.

The potential for significant decision errors were minimized by:

- Completion of a QA/QC assessment of the investigation data to assess if the data satisfies the DQIs;

- Assessment of whether appropriate sampling and analytical densities were completed for the purpose of the investigation; and

- Ensuring that the criteria set for the investigation were appropriate for the proposed use of Parcel 18.

Minimization of the potential for significant decision errors limits the potential that a conclusive statement may be incorrect.

Step 7 – Optimisation of the Design of Collection of Data

The collection of data was optimized by the completion of a Phase 1 ESA (ENVIRON 2013b), data gap review and development of a sampling strategy. Attainment of the DQOs has been assessed by reference to the DQIs, presented below.

DATA QUALITY INDICATORS

The project Data Quality Indicators (DQIs) have been established to set acceptance limits on field and laboratory data collected as part of this investigation. Field and laboratory procedures acceptance limits are set at different levels for different projects and by different laboratories. Non-compliances with acceptance limits are to be documented and discussed in the report. The DQIs are presented in Table A.

Table A: Data Quality Indicators

DQI	Field	Laboratory	Acceptability Limits
Completeness	All critical locations sampled, including targeted sampling of areas of environmental concern identified during the site walkover. Fluoride soil sampling completed on a reduced density to identify if fluoride in surface soils is an issue. All samples collected Experienced sampler Documentation correct	All critical samples analysed and all analytes analysed according to Standard Operating Procedures (SOPs) Appropriate Practical Quantitation Limits (PQLs) Sample documentation complete Sample holding times complied with	As per NEPM (2013)
Comparability	Experienced sampler In the event of multiple sampling events: Same types of samples collected Same sampling methodologies used Climatic conditions	Same analytical methods used Same PQLs Same units Same primary and secondary laboratories	As per NEPM (2013)
Representativeness	Appropriate media sampled Relevant media sampled	All samples analysed according to SOPs	
Precision	Collection of duplicate samples Sampling methodologies appropriate and complied with	Analysis of: Blind duplicate samples at rate of 1 in 10 samples Split duplicate samples at rate of 1 in 20 samples Laboratory duplicate samples	 RPD of 30 to 50% RPD of 30 to 50% RPD of 30 to 50%

Accuracy	Sampling methodologies appropriate and complied with.	Analysis of: Method blanks Matrix spikes Surrogate spikes Laboratory control samples Reagent blanks Reference material	 Non-detect 70 to 130% 70-130% 70 to 130%

QUALITY ASSURANCE AND QUALITY CONTROL

A quality assurance assessment for this report is presented in Table B and C below. An assessment was made of data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations, as outlined in NSW DEC (2006) and NSW EPA (2007) guidelines.

Table B: QA/QC – Sampling and Analysis Methodology Assessment

Sampling Methodology	Methodology
Sampling Pattern and Locations	Surface soil sampling was undertaken in an approximate grid across Parcel 18 to assess the impact of particulate fallout from Hydro Aluminium Smelter.
Sampling Density	Twenty seven soil samples were collected spaced evenly across Parcel 18 which is approximately 613 ha. A dry section of the Wentworth Swamp soil was also analysed for fluoride concentration in particulate fallout. The purpose of the sampling was to assess for impacts from smelter particulate fallout and therefore is considered suitable in density and spatial layout. .
Sample depths	Surface soil samples were collected from a grid across the entire of Parcel 18 from surface soils.
Sample Collection Method	Surface soil samples across Parcel 18 were collected directly from the ground surface using using dedicated disposable gloves and a hand trowel. The hand trowel was brushed clean prior to sample collection. Soil samples were collected into laboratory supplied, acid rinsed glass jars.
Decontamination Procedures	Surface soil samples across Parcel 18 were collected directly from the ground surface using using dedicated disposable gloves and a hand trowel. The hand trowel was generally used to loosen the soil prior to sample collection and was brushed clean between sample locations.
Sample handling and containers	All soil samples were placed into laboratory-supplied glass jars.. Soil samples were placed on ice following collection and during transportation to the laboratory.
Chain of Custody	Samples were transported to the laboratory under chain of custody conditions. The chain of custody forms were signed by the laboratory on receipt of the samples.
Detailed description of field screening protocols	Field screening for volatiles was not completed during soil sampling as volatile contaminants were not the main chemical of concern.

Table B: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling Methodology	**Methodology**
Calibration of field equipment	No field equipment requiring calibration was used during this assessment.
Sampling Logs	The lithology of surface soil samples was documented on the field information sheets, which are included in Appendix C.

Table C: QA/QC – Field and Lab Quality Assurance and Quality Control	
Field and Lab QA/QC	**ENVIRON Comments**
Field quality control samples	Intra-laboratory duplicate soil samples were analysed at a ratio of 1:10 for fluoride analysed for the grid samples across the entire of Parcel 18. No rinsate blank samples were collected.
Field quality control results	Intra-laboratory duplicate results are presented in Table C. There were no RPD exceedences for the intra-laboratory duplicates collected for this assessment.
NATA registered laboratory and NATA endorsed methods	ALS was used as the primary laboratory. ALS laboratory certificates are NATA stamped and the lab is accredited for the analyses performed for this assessment.
Analytical methods	A summary of analytical methods were included in the laboratory test certificates.
Holding times	Review of the COCs and laboratory certificates indicate that holding times were met.
Practical Quantitation Limits (PQLs)	PQLs for all soil analytes were below Parcel 18 assessment criteria.
Laboratory quality control samples	Laboratory quality control samples including duplicates, laboratory control samples, matrix spikes, surrogate spikes and blanks were undertaken by the laboratories at appropriate frequencies.
Laboratory quality control results	All results for laboratory soil duplicates, laboratory control samples, matrix spikes and surrogates were acceptable and no detections were made in blank samples.

Overall it is considered that the completed investigation works and the data obtained adequately complied with the requirements of NSW DEC (2006) and NSW EPA (2007) guidelines and that the data is of suitable quality to meet the project objectives.